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## SEQUENCE LISTING

&lt;110&gt; Koichiro KAKU, et al.

&lt;120&gt; GENE CODING FOR ACETOLACTATE SYNTHASE

&lt;130&gt; 1254-0259PUS1

&lt;140&gt; US 10/509,121

&lt;141&gt; 2004-09-28

&lt;150&gt; JP 2002-95721

&lt;151&gt; 2002-03-29

&lt;160&gt; 39

&lt;170&gt; PatentIn Ver. 2.0

&lt;210&gt; 1

&lt;211&gt; 2301

&lt;212&gt; DNA

&lt;213&gt; Oryza sativa var. kinmaze

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (48) .. (1979)

&lt;400&gt; 1

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gcc gag ccc cgc aag ggc gcg gac atc ctc gtg gag gcg ctg gag cgg      296
Ala Glu Pro Arg Lys Gly Ala Asp Ile Leu Val Glu Ala Leu Glu Arg
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tgc ggc gtc agc gac gtg ttc gcc tac ccg ggc ggc gcg tcc atg gag      344
Cys Gly Val Ser Asp Val Phe Ala Tyr Pro Gly Gly Ala Ser Met Glu
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Arg	His	Glu	Gln	Gly	Glu	Ala	Phe	Ala	Ala	Ser	Gly	Tyr	Ala	Arg	Ala	
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Ser	Gly	Arg	Val	Gly	Val	Cys	Val	Ala	Thr	Ser	Gly	Pro	Gly	Ala	Thr	
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Asn	Leu	Val	Ser	Ala	Leu	Ala	Asp	Ala	Leu	Leu	Asp	Ser	Val	Pro	Met	
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Val	Ala	Ile	Thr	Gly	Gln	Val	His	Ser	Arg	Met	Ile	Gly	Thr	Asp	Ala	
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Phe	Gln	Glu	Thr	Pro	Ile	Val	Glu	Val	Thr	Arg	Ser	Ile	Thr	Lys	His	
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gcc	ttc	ttc	ctc	gcg	tcc	tcg	ggc	cgt	cct	ggc	ccg	gtg	ctg	gtc	gac	728
Ala	Phe	Phe	Leu	Ala	Ser	Ser	Gly	Arg	Pro	Gly	Pro	Val	Leu	Val	Asp	
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Ile	Pro	Lys	Asp	Ile	Gln	Gln	Gln	Met	Ala	Val	Pro	Val	Trp	Asp	Thr	
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Ser	Met	Asn	Leu	Pro	Gly	Tyr	Ile	Ala	Arg	Leu	Pro	Lys	Pro	Pro	Ala	
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Pro	Ile	Leu	Tyr	Val	Gly	Gly	Gly	Cys	Ser	Ala	Ser	Gly	Asp	Glu	Leu	
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Arg	Trp	Phe	Val	Glu	Leu	Thr	Gly	Ile	Pro	Val	Thr	Thr	Thr	Leu	Met	
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Gly	Leu	Gly	Asn	Phe	Pro	Ser	Asp	Asp	Pro	Leu	Ser	Leu	Arg	Met	Leu	
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ggg	atg	cat	ggc	acg	gtg	tac	gca	aat	tat	gcc	gtg	gat	aag	gct	gac	1064
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Leu Leu Leu Ala Phe Gly Val Arg Phe Asp Asp Arg Val Thr Gly Lys			
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cca gca gag att gga aag aac aag caa cca cat gtg tca att tgc gca			1208
Pro Ala Glu Ile Gly Lys Asn Lys Gln Pro His Val Ser Ile Cys Ala			
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Asp Val Lys Leu Ala Leu Gln Gly Leu Asn Ala Leu Leu Gln Gln Ser			
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Thr Thr Lys Thr Ser Ser Asp Phe Ser Ala Trp His Asn Glu Leu Asp			
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Ile Pro Pro Gln Tyr Ala Ile Gln Val Leu Asp Glu Leu Thr Lys Gly			
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Glu Ala Ile Ile Ala Thr Gly Val Gly Gln His Gln Met Trp Ala Ala			
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caa tat tac acc tac aag cgg cca cgg cag tgg ctg tct tcg gct ggt			1496
Gln Tyr Tyr Thr Tyr Lys Arg Pro Arg Gln Trp Leu Ser Ser Ala Gly			
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Leu Gly Ala Met Gly Phe Gly Leu Pro Ala Ala Ala Gly Ala Ser Val			
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gct aac cca ggt gtc aca gtt gtt gat att gat ggg gat ggt agc ttc			1592
Ala Asn Pro Gly Val Thr Val Val Asp Ile Asp Gly Asp Gly Ser Phe			
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ctc atg aac att cag gag ctg gca ttg atc cgc att gag aac ctc cct			1640
Leu Met Asn Ile Gln Glu Leu Ala Leu Ile Arg Ile Glu Asn Leu Pro			
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gtg aag gtg atg gtg ttg aac aac caa cat ttg ggt atg gtg gtg caa			1688
Val Lys Val Met Val Leu Asn Asn Gln His Leu Gly Met Val Val Gln			
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Trp Glu Asp Arg Phe Tyr Lys Ala Asn Arg Ala His Thr Tyr Leu Gly			
	550	555	560

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aac ccg gaa tgt gag agc gag ata tat cca gat ttt gtg act att gct 1784
Asn Pro Glu Cys Glu Ser Glu Ile Tyr Pro Asp Phe Val Thr Ile Ala
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aag ggg ttc aat att cct gca gtc cgt gta aca aag aag agt gaa gtc 1832
Lys Gly Phe Asn Ile Pro Ala Val Arg Val Thr Lys Lys Ser Glu Val
580 585 590 595

cgt gcc gcc atc aag aag atg ctc gag act cca ggg cca tac ttg ttg 1880
Arg Ala Ala Ile Lys Lys Met Leu Glu Thr Pro Gly Pro Tyr Leu Leu
600 605 610

gat atc atc gtc ccg cac cag gag cat gtg ctg cct atg atc cca agt 1928
Asp Ile Ile Val Pro His Gln Glu His Val Leu Pro Met Ile Pro Ser
615 620 625

ggg ggc gca ttc aag gac atg atc ctg gat ggt gat ggc agg act gtg 1976
Gly Gly Ala Phe Lys Asp Met Ile Leu Asp Gly Asp Gly Arg Thr Val
630 635 640

tat taatctataa tctgtatggt ggcaaagcac cagcccggcc tatgtttgac 2029
Tyr

ctgaatgacc cataaagagt ggtatgccta tgatgtttgt atgtgctcta tcaataacta 2089

agggtgtcaac tatgaaccat atgctcttct gttttacttg tttgatgtgc ttggcatggg 2149

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<213> Oryza sativa var. kinmaze

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Pro Val Thr Pro Pro Ser Pro Ala Pro Pro Ala Thr Pro Leu Arg Pro
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Trp Gly Pro Ala Glu Pro Arg Lys Gly Ala Asp Ile Leu Val Glu Ala
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Leu Glu Arg Cys Gly Val Ser Asp Val Phe Ala Tyr Pro Gly Gly Ala

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Gly	Ala	Thr	Asn	Leu	Val	Ser	Ala	Leu	Ala	Asp	Ala	Leu	Leu	Asp	Ser				
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Lys	Ala	Asp	Leu	Leu	Leu	Ala	Phe	Gly	Val	Arg	Phe	Asp	Asp	Arg	Val				
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Asp	Ile	Asp	Pro	Ala	Glu	Ile	Gly	Lys	Asn	Lys	Gln	Pro	His	Val	Ser				
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385		390		395		400
Gln Gln Ser Thr Thr Lys Thr Ser Ser Asp Phe Ser Ala Trp His Asn						
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Glu Leu Asp Gln Gln Lys Arg Glu Phe Pro Leu Gly Tyr Lys Thr Phe						
	420			425		430
Gly Glu Glu Ile Pro Pro Gln Tyr Ala Ile Gln Val Leu Asp Glu Leu						
	435			440		445
Thr Lys Gly Glu Ala Ile Ile Ala Thr Gly Val Gly Gln His Gln Met						
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Trp Ala Ala Gln Tyr Tyr Thr Tyr Lys Arg Pro Arg Gln Trp Leu Ser						
	465			470		475
Ser Ala Gly Leu Gly Ala Met Gly Phe Gly Leu Pro Ala Ala Ala Gly						
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Ala Ser Val Ala Asn Pro Gly Val Thr Val Val Asp Ile Asp Gly Asp						
	500			505		510
Gly Ser Phe Leu Met Asn Ile Gln Glu Leu Ala Leu Ile Arg Ile Glu						
	515			520		525
Asn Leu Pro Val Lys Val Met Val Leu Asn Asn Gln His Leu Gly Met						
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Val Val Gln Trp Glu Asp Arg Phe Tyr Lys Ala Asn Arg Ala His Thr						
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Tyr Leu Gly Asn Pro Glu Cys Glu Ser Glu Ile Tyr Pro Asp Phe Val						
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Thr Ile Ala Lys Gly Phe Asn Ile Pro Ala Val Arg Val Thr Lys Lys						
	580			585		590
Ser Glu Val Arg Ala Ala Ile Lys Lys Met Leu Glu Thr Pro Gly Pro						
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Tyr Leu Leu Asp Ile Ile Val Pro His Gln Glu His Val Leu Pro Met						
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Ile Pro Ser Gly Gly Ala Phe Lys Asp Met Ile Leu Asp Gly Asp Gly						
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Arg Thr Val Tyr

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Thr Gly Arg Lys Asn His Gln Arg His His Val Leu Pro Ala Arg Gly
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Ala Glu Pro Arg Lys Gly Ala Asp Ile Leu Val Glu Ala Leu Glu Arg
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tgc ggc gtc agc gac gtg ttc gcc tac ccg ggc ggc gcg tcc atg gag 344
Cys Gly Val Ser Asp Val Phe Ala Tyr Pro Gly Gly Ala Ser Met Glu
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Ser Gly Arg Val Gly Val Cys Val Ala Thr Ser Gly Pro Gly Ala Thr
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Val Ala Ile Thr Gly Gln Val His Arg Arg Met Ile Gly Thr Asp Ala
      165                      170                      175

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Phe Gln Glu Thr Pro Ile Val Glu Val Thr Arg Ser Ile Thr Lys His
180                      185                      190                      195

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Ile	Pro	Lys	Asp	Ile	Gln	Gln	Gln	Met	Ala	Val	Pro	Val	Trp	Asp	Thr		
		230					235					240					
tcg	atg	aat	cta	cca	ggg	tac	atc	gca	cgc	ctg	ccc	aag	cca	ccc	gcg	824	
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Thr	Glu	Leu	Leu	Glu	Gln	Val	Leu	Arg	Leu	Val	Gly	Glu	Ser	Arg	Arg		
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Arg	Trp	Phe	Val	Glu	Leu	Thr	Gly	Ile	Pro	Val	Thr	Thr	Thr	Leu	Met		
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	325					330				335							
ctg	ttg	ctt	gcg	ttt	ggg	gtg	cgg	ttt	gat	gat	cgt	gtg	aca	ggg	aaa	1112	
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att	gag	gct	ttt	gca	agc	agg	gcc	aag	att	gtg	cac	att	gac	att	gat	1160	
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Pro	Ala	Glu	Ile	Gly	Lys	Asn	Lys	Gln	Pro	His	Val	Ser	Ile	Cys	Ala		
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Thr	Thr	Lys	Thr	Ser	Ser	Asp	Phe	Ser	Ala	Trp	His	Asn	Glu	Leu	Asp		
	405					410			415								
cag	cag	aag	agg	gag	ttt	cct	ctg	ggg	tac	aaa	act	ttt	ggg	gaa	gag	1352	
Gln	Gln	Lys	Arg	Glu	Phe	Pro	Leu	Gly	Tyr	Lys	Thr	Phe	Gly	Glu	Glu		



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Ile Pro Pro Gln Tyr Ala Ile Gln Val Leu Asp Glu Leu Thr Lys Gly							
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Glu Ala Ile Ile Ala Thr Gly Val Gly Gln His Gln Met Trp Ala Ala							
	455		460		465		
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Gln Tyr Tyr Thr Tyr Lys Arg Pro Arg Gln Trp Leu Ser Ser Ala Gly							
	470		475		480		
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Leu Gly Ala Met Gly Phe Gly Leu Pro Ala Ala Ala Gly Ala Ser Val							
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gct aac cca ggt gtc aca gtt gtt gat att gat ggg gat ggt agc ttc							1592
Ala Asn Pro Gly Val Thr Val Val Asp Ile Asp Gly Asp Gly Ser Phe							
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ctc atg aac att cag gag ctg gca ttg atc cgc att gag aac ctc cct							1640
Leu Met Asn Ile Gln Glu Leu Ala Leu Ile Arg Ile Glu Asn Leu Pro							
	520		525		530		
gtg aag gtg atg gtg ttg aac aac caa cat ttg ggt atg gtg gtg caa							1688
Val Lys Val Met Val Leu Asn Asn Gln His Leu Gly Met Val Val Gln							
	535		540		545		
ttg gag gat agg ttt tac aag gcg aat agg gcg cat aca tac ttg ggc							1736
Leu Glu Asp Arg Phe Tyr Lys Ala Asn Arg Ala His Thr Tyr Leu Gly							
	550		555		560		
aac ccg gaa tgt gag agc gag ata tat cca gat ttt gtg act att gct							1784
Asn Pro Glu Cys Glu Ser Glu Ile Tyr Pro Asp Phe Val Thr Ile Ala							
	565		570		575		
aag ggg ttc aat att cct gca gtc cgt gta aca aag aag agt gaa gtc							1832
Lys Gly Phe Asn Ile Pro Ala Val Arg Val Thr Lys Lys Ser Glu Val							
	580		585		590		595
cgt gcc gcc atc aag aag atg ctc gag act cca ggg cca tac ttg ttg							1880
Arg Ala Ala Ile Lys Lys Met Leu Glu Thr Pro Gly Pro Tyr Leu Leu							
	600		605		610		
gat atc atc gtc ccg cac cag gag cat gtg ctg cct atg atc cca agt							1928
Asp Ile Ile Val Pro His Gln Glu His Val Leu Pro Met Ile Pro Ser							
	615		620		625		
ggg ggc gca ttc aag gac atg atc ctg gat ggt gat ggc agg act gtg							1976
Gly Gly Ala Phe Lys Asp Met Ile Leu Asp Gly Asp Gly Arg Thr Val							
	630		635		640		
tat taatctataa tctgtatggt ggcaaagcac cagcccggcc tatgtttgac							2029
Tyr							

ctgaatgacc cataaagagt ggtatgccta tgatgtttgt atgtgctcta tcaataacta 2089  
 aggtgtcaac tatgaaccat atgctcttct gttttacttg tttgatgtgc ttggcatggg 2149  
 aatcctaatt agcttcctgc tgtctaggtt tgtagtgtgt tgttttctgt aggcatatgc 2209  
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 Ala Arg Gly Arg Val Gly Ala Ala Ala Val Arg Cys Ser Ala Val Ser  
           35                  40                  45  
 Pro Val Thr Pro Pro Ser Pro Ala Pro Pro Ala Thr Pro Leu Arg Pro  
       50                  55                  60  
 Trp Gly Pro Ala Glu Pro Arg Lys Gly Ala Asp Ile Leu Val Glu Ala  
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 Leu Glu Arg Cys Gly Val Ser Asp Val Phe Ala Tyr Pro Gly Gly Ala  
                   85                  90                  95  
 Ser Met Glu Ile His Gln Ala Leu Thr Arg Ser Pro Val Ile Thr Asn  
           100                  105                  110  
 His Leu Phe Arg His Glu Gln Gly Glu Ala Phe Ala Ala Ser Gly Tyr  
       115                  120                  125  
 Ala Arg Ala Ser Gly Arg Val Gly Val Cys Val Ala Thr Ser Gly Pro  
       130                  135                  140  
 Gly Ala Thr Asn Leu Val Ser Ala Leu Ala Asp Ala Leu Leu Asp Ser  
   145                  150                  155                  160  
 Val Pro Met Val Ala Ile Thr Gly Gln Val His Arg Arg Met Ile Gly  
           165                  170                  175  
 Thr Asp Ala Phe Gln Glu Thr Pro Ile Val Glu Val Thr Arg Ser Ile  
       180                  185                  190  
 Thr Lys His Asn Tyr Leu Val Leu Asp Val Glu Asp Ile Pro Arg Val  
       195                  200                  205  
 Ile Gln Glu Ala Phe Phe Leu Ala Ser Ser Gly Arg Pro Gly Pro Val

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Leu Val Asp Ile Pro Lys Asp Ile Gln Gln Gln Met Ala Val Pro Val		
225	230	235 240
Trp Asp Thr Ser Met Asn Leu Pro Gly Tyr Ile Ala Arg Leu Pro Lys		
	245	250 255
Pro Pro Ala Thr Glu Leu Leu Glu Gln Val Leu Arg Leu Val Gly Glu		
	260	265 270
Ser Arg Arg Pro Ile Leu Tyr Val Gly Gly Gly Cys Ser Ala Ser Gly		
	275	280 285
Asp Glu Leu Arg Trp Phe Val Glu Leu Thr Gly Ile Pro Val Thr Thr		
	290	295 300
Thr Leu Met Gly Leu Gly Asn Phe Pro Ser Asp Asp Pro Leu Ser Leu		
305	310	315 320
Arg Met Leu Gly Met His Gly Thr Val Tyr Ala Asn Tyr Ala Val Asp		
	325	330 335
Lys Ala Asp Leu Leu Leu Ala Phe Gly Val Arg Phe Asp Asp Arg Val		
	340	345 350
Thr Gly Lys Ile Glu Ala Phe Ala Ser Arg Ala Lys Ile Val His Ile		
	355	360 365
Asp Ile Asp Pro Ala Glu Ile Gly Lys Asn Lys Gln Pro His Val Ser		
	370	375 380
Ile Cys Ala Asp Val Lys Leu Ala Leu Gln Gly Leu Asn Ala Leu Leu		
385	390	395 400
Gln Gln Ser Thr Thr Lys Thr Ser Ser Asp Phe Ser Ala Trp His Asn		
	405	410 415
Glu Leu Asp Gln Gln Lys Arg Glu Phe Pro Leu Gly Tyr Lys Thr Phe		
	420	425 430
Gly Glu Glu Ile Pro Pro Gln Tyr Ala Ile Gln Val Leu Asp Glu Leu		
	435	440 445
Thr Lys Gly Glu Ala Ile Ile Ala Thr Gly Val Gly Gln His Gln Met		
	450	455 460
Trp Ala Ala Gln Tyr Tyr Thr Tyr Lys Arg Pro Arg Gln Trp Leu Ser		
465	470	475 480
Ser Ala Gly Leu Gly Ala Met Gly Phe Gly Leu Pro Ala Ala Ala Gly		
	485	490 495
Ala Ser Val Ala Asn Pro Gly Val Thr Val Val Asp Ile Asp Gly Asp		
	500	505 510
Gly Ser Phe Leu Met Asn Ile Gln Glu Leu Ala Leu Ile Arg Ile Glu		

515					520					525					
Asn	Leu	Pro	Val	Lys	Val	Met	Val	Leu	Asn	Asn	Gln	His	Leu	Gly	Met
530					535					540					
Val	Val	Gln	Leu	Glu	Asp	Arg	Phe	Tyr	Lys	Ala	Asn	Arg	Ala	His	Thr
545					550					555					560
Tyr	Leu	Gly	Asn	Pro	Glu	Cys	Glu	Ser	Glu	Ile	Tyr	Pro	Asp	Phe	Val
			565						570					575	
Thr	Ile	Ala	Lys	Gly	Phe	Asn	Ile	Pro	Ala	Val	Arg	Val	Thr	Lys	Lys
			580					585					590		
Ser	Glu	Val	Arg	Ala	Ala	Ile	Lys	Lys	Met	Leu	Glu	Thr	Pro	Gly	Pro
		595					600					605			
Tyr	Leu	Leu	Asp	Ile	Ile	Val	Pro	His	Gln	Glu	His	Val	Leu	Pro	Met
	610					615					620				
Ile	Pro	Ser	Gly	Gly	Ala	Phe	Lys	Asp	Met	Ile	Leu	Asp	Gly	Asp	Gly
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Arg Thr Val Tyr															

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acc gcc gcg gcc gcg gcc gcc gcc ctg tcc gcc gcc gcg acg gcc aag Thr Ala Ala Ala Ala Ala Ala Ala Leu Ser Ala Ala Ala Thr Ala Lys <div style="text-align: right;">5</div> <div style="text-align: right;">10</div> <div style="text-align: right;">15</div>														104
acc ggc cgt aag aac cac cag cga cac cac gtc ctt ccc gct cga ggc Thr Gly Arg Lys Asn His Gln Arg His His Val Leu Pro Ala Arg Gly <div style="text-align: right;">20</div> <div style="text-align: right;">25</div> <div style="text-align: right;">30</div> <div style="text-align: right;">35</div>														152
cgg gtg ggg gcg gcg gcg gtc agg tgc tgc gcg gtg tcc ccg gtc acc Arg Val Gly Ala Ala Ala Val Arg Cys Ser Ala Val Ser Pro Val Thr <div style="text-align: right;">40</div> <div style="text-align: right;">45</div> <div style="text-align: right;">50</div>														200
ccg ccg tcc ccg gcg ccg ccg gcc acg ccg ctc cgg ccg tgg ggg ccg Pro Pro Ser Pro Ala Pro Pro Ala Thr Pro Leu Arg Pro Trp Gly Pro <div style="text-align: right;">55</div> <div style="text-align: right;">60</div> <div style="text-align: right;">65</div>														248

gcc gag ccc cgc aag ggc gcg gac atc ctc gtg gag gcg ctg gag cgg	296
Ala Glu Pro Arg Lys Gly Ala Asp Ile Leu Val Glu Ala Leu Glu Arg	
70 75 80	
tgc ggc gtc agc gac gtg ttc gcc tac ccg ggc ggc gcg tcc atg gag	344
Cys Gly Val Ser Asp Val Phe Ala Tyr Pro Gly Gly Ala Ser Met Glu	
85 90 95	
atc cac cag gcg ctg acg cgc tcc ccg gtc atc acc aac cac ctc ttc	392
Ile His Gln Ala Leu Thr Arg Ser Pro Val Ile Thr Asn His Leu Phe	
100 105 110 115	
cgc cac gag cag ggc gag gcg ttc gcg gcg tcc ggg tac gcg cgc gcg	440
Arg His Glu Gln Gly Glu Ala Phe Ala Ala Ser Gly Tyr Ala Arg Ala	
120 125 130	
tcc ggc cgc gtc ggg gtc tgc gtc gcc acc tcc ggc ccc ggg gca acc	488
Ser Gly Arg Val Gly Val Cys Val Ala Thr Ser Gly Pro Gly Ala Thr	
135 140 145	
aac ctc gtg tcc gcg ctc gcc gac gcg ctg ctc gac tcc gtc ccg atg	536
Asn Leu Val Ser Ala Leu Ala Asp Ala Leu Leu Asp Ser Val Pro Met	
150 155 160	
gtc gcc atc acg ggc cag gtc cac cgc cgc atg atc ggc acc gac gcc	584
Val Ala Ile Thr Gly Gln Val His Arg Arg Met Ile Gly Thr Asp Ala	
165 170 175	
ttc cag gag acg ccc ata gtc gag gtc acc cgc tcc atc acc aag cac	632
Phe Gln Glu Thr Pro Ile Val Glu Val Thr Arg Ser Ile Thr Lys His	
180 185 190 195	
aat tac ctt gtc ctt gat gtg gag gac atc ccc cgc gtc ata cag gaa	680
Asn Tyr Leu Val Leu Asp Val Glu Asp Ile Pro Arg Val Ile Gln Glu	
200 205 210	
gcc ttc ttc ctc gcg tcc tcg ggc cgt cct ggc ccg gtg ctg gtc gac	728
Ala Phe Phe Leu Ala Ser Ser Gly Arg Pro Gly Pro Val Leu Val Asp	
215 220 225	
atc ccc aag gac atc cag cag cag atg gcc gtg ccg gtc tgg gac acc	776
Ile Pro Lys Asp Ile Gln Gln Gln Met Ala Val Pro Val Trp Asp Thr	
230 235 240	
tcg atg aat cta cca ggg tac atc gca cgc ctg ccc aag cca ccc gcg	824
Ser Met Asn Leu Pro Gly Tyr Ile Ala Arg Leu Pro Lys Pro Pro Ala	
245 250 255	
aca gaa ttg ctt gag cag gtc ttg cgt ctg gtt ggc gag tca cgg cgc	872
Thr Glu Leu Leu Glu Gln Val Leu Arg Leu Val Gly Glu Ser Arg Arg	
260 265 270 275	
ccg att ctc tat gtc ggt ggt ggc tgc tct gca tct ggt gac gaa ttg	920
Pro Ile Leu Tyr Val Gly Gly Gly Cys Ser Ala Ser Gly Asp Glu Leu	
280 285 290	
cgc tgg ttt gtt gag ctg act ggt atc cca gtt aca acc act ctg atg	968

Arg	Trp	Phe	Val	Glu	Leu	Thr	Gly	Ile	Pro	Val	Thr	Thr	Thr	Leu	Met	
			295					300						305		
ggc	ctc	ggc	aat	ttc	ccc	agt	gac	gac	ccg	ttg	tcc	ctg	cgc	atg	ctt	1016
Gly	Leu	Gly	Asn	Phe	Pro	Ser	Asp	Asp	Pro	Leu	Ser	Leu	Arg	Met	Leu	
		310					315					320				
ggg	atg	cat	ggc	acg	gtg	tac	gca	aat	tat	gcc	gtg	gat	aag	gct	gac	1064
Gly	Met	His	Gly	Thr	Val	Tyr	Ala	Asn	Tyr	Ala	Val	Asp	Lys	Ala	Asp	
	325					330				335						
ctg	ttg	ctt	gcg	ttt	ggg	gtg	cgg	ttt	gat	gat	cgt	gtg	aca	ggg	aaa	1112
Leu	Leu	Leu	Ala	Phe	Gly	Val	Arg	Phe	Asp	Asp	Arg	Val	Thr	Gly	Lys	
340					345				350						355	
att	gag	gct	ttt	gca	agc	agg	gcc	aag	att	gtg	cac	att	gac	att	gat	1160
Ile	Glu	Ala	Phe	Ala	Ser	Arg	Ala	Lys	Ile	Val	His	Ile	Asp	Ile	Asp	
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cca	gca	gag	att	gga	aag	aac	aag	caa	cca	cat	gtg	tca	att	tgc	gca	1208
Pro	Ala	Glu	Ile	Gly	Lys	Asn	Lys	Gln	Pro	His	Val	Ser	Ile	Cys	Ala	
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gat	gtt	aag	ctt	gct	tta	cag	ggc	ttg	aat	gct	ctg	cta	caa	cag	agc	1256
Asp	Val	Lys	Leu	Ala	Leu	Gln	Gly	Leu	Asn	Ala	Leu	Leu	Gln	Gln	Ser	
		390					395					400				
aca	aca	aag	aca	agt	tct	gat	ttt	agt	gca	tgg	cac	aat	gag	ttg	gac	1304
Thr	Thr	Lys	Thr	Ser	Ser	Asp	Phe	Ser	Ala	Trp	His	Asn	Glu	Leu	Asp	
	405					410					415					
cag	cag	aag	agg	gag	ttt	cct	ctg	ggg	tac	aaa	act	ttt	ggg	gaa	gag	1352
Gln	Gln	Lys	Arg	Glu	Phe	Pro	Leu	Gly	Tyr	Lys	Thr	Phe	Gly	Glu	Glu	
420					425				430					435		
atc	cca	ccg	caa	tat	gcc	att	cag	gtg	ctg	gat	gag	ctg	acg	aaa	ggg	1400
Ile	Pro	Pro	Gln	Tyr	Ala	Ile	Gln	Val	Leu	Asp	Glu	Leu	Thr	Lys	Gly	
			440				445						450			
gag	gca	atc	atc	gct	act	ggg	gtt	ggg	cag	cac	cag	atg	tgg	gcg	gca	1448
Glu	Ala	Ile	Ile	Ala	Thr	Gly	Val	Gly	Gln	His	Gln	Met	Trp	Ala	Ala	
			455				460						465			
caa	tat	tac	acc	tac	aag	cgg	cca	cgg	cag	tgg	ctg	tct	tcg	gct	ggg	1496
Gln	Tyr	Tyr	Thr	Tyr	Lys	Arg	Pro	Arg	Gln	Trp	Leu	Ser	Ser	Ala	Gly	
		470					475					480				
ctg	ggc	gca	atg	gga	ttt	ggg	ctg	cct	gct	gca	gct	ggg	gct	tct	gtg	1544
Leu	Gly	Ala	Met	Gly	Phe	Gly	Leu	Pro	Ala	Ala	Ala	Gly	Ala	Ser	Val	
	485					490					495					
gct	aac	cca	ggg	gtc	aca	gtt	gtt	gat	att	gat	ggg	gat	ggg	agc	ttc	1592
Ala	Asn	Pro	Gly	Val	Thr	Val	Val	Asp	Ile	Asp	Gly	Asp	Gly	Ser	Phe	
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ctc	atg	aac	att	cag	gag	ctg	gca	ttg	atc	cgc	att	gag	aac	ctc	cct	1640
Leu	Met	Asn	Ile	Gln	Glu	Leu	Ala	Leu	Ile	Arg	Ile	Glu	Asn	Leu	Pro	

520										525					530					
gtg	aag	gtg	atg	gtg	ttg	aac	aac	caa	cat	ttg	ggg	atg	gtg	gtg	caa	1688				
Val	Lys	Val	Met	Val	Leu	Asn	Asn	Gln	His	Leu	Gly	Met	Val	Val	Gln					
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ttg	gag	gat	agg	ttt	tac	aag	gag	aat	agg	gag	cat	aca	tac	ttg	ggc	1736				
Trp	Glu	Asp	Arg	Phe	Tyr	Lys	Ala	Asn	Arg	Ala	His	Thr	Tyr	Leu	Gly					
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Asn	Pro	Glu	Cys	Glu	Ser	Glu	Ile	Tyr	Pro	Asp	Phe	Val	Thr	Ile	Ala					
565					570					575										
aag	ggg	ttc	aat	att	cct	gca	gtc	cgt	gta	aca	aag	aag	agt	gaa	gtc	1832				
Lys	Gly	Phe	Asn	Ile	Pro	Ala	Val	Arg	Val	Thr	Lys	Lys	Ser	Glu	Val					
580					585					590					595					
cgt	gcc	gcc	atc	aag	aag	atg	ctc	gag	act	cca	ggg	cca	tac	ttg	ttg	1880				
Arg	Ala	Ala	Ile	Lys	Lys	Met	Leu	Glu	Thr	Pro	Gly	Pro	Tyr	Leu	Leu					
600					605					610										
gat	atc	atc	gtc	ccg	cac	cag	gag	cat	gtg	ctg	cct	atg	atc	cca	att	1928				
Asp	Ile	Ile	Val	Pro	His	Gln	Glu	His	Val	Leu	Pro	Met	Ile	Pro	Ile					
615					620					625										
ggg	ggc	gca	ttc	aag	gac	atg	atc	ctg	gat	ggg	gat	ggc	agg	act	gtg	1976				
Gly	Gly	Ala	Phe	Lys	Asp	Met	Ile	Leu	Asp	Gly	Asp	Gly	Arg	Thr	Val					
630					635					640										
tat taatctataa tctgtatggt ggcaaagcac cagcccggcc tatgtttgac 2029																				
Tyr																				
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 Ala Arg Gly Arg Val Gly Ala Ala Ala Val Arg Cys Ser Ala Val Ser

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Pro	Val	Thr	Pro	Pro	Ser	Pro	Ala	Pro	Pro	Ala	Thr	Pro	Leu	Arg	Pro
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Trp	Gly	Pro	Ala	Glu	Pro	Arg	Lys	Gly	Ala	Asp	Ile	Leu	Val	Glu	Ala
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Leu	Glu	Arg	Cys	Gly	Val	Ser	Asp	Val	Phe	Ala	Tyr	Pro	Gly	Gly	Ala
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Ser	Met	Glu	Ile	His	Gln	Ala	Leu	Thr	Arg	Ser	Pro	Val	Ile	Thr	Asn
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His	Leu	Phe	Arg	His	Glu	Gln	Gly	Glu	Ala	Phe	Ala	Ala	Ser	Gly	Tyr
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Ala	Arg	Ala	Ser	Gly	Arg	Val	Gly	Val	Cys	Val	Ala	Thr	Ser	Gly	Pro
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Gly	Ala	Thr	Asn	Leu	Val	Ser	Ala	Leu	Ala	Asp	Ala	Leu	Leu	Asp	Ser
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Val	Pro	Met	Val	Ala	Ile	Thr	Gly	Gln	Val	His	Arg	Arg	Met	Ile	Gly
				165					170					175	
Thr	Asp	Ala	Phe	Gln	Glu	Thr	Pro	Ile	Val	Glu	Val	Thr	Arg	Ser	Ile
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Thr	Lys	His	Asn	Tyr	Leu	Val	Leu	Asp	Val	Glu	Asp	Ile	Pro	Arg	Val
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Ile	Gln	Glu	Ala	Phe	Phe	Leu	Ala	Ser	Ser	Gly	Arg	Pro	Gly	Pro	Val
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Trp	Asp	Thr	Ser	Met	Asn	Leu	Pro	Gly	Tyr	Ile	Ala	Arg	Leu	Pro	Lys
				245					250					255	
Pro	Pro	Ala	Thr	Glu	Leu	Leu	Glu	Gln	Val	Leu	Arg	Leu	Val	Gly	Glu
			260					265					270		
Ser	Arg	Arg	Pro	Ile	Leu	Tyr	Val	Gly	Gly	Gly	Cys	Ser	Ala	Ser	Gly
		275					280					285			
Asp	Glu	Leu	Arg	Trp	Phe	Val	Glu	Leu	Thr	Gly	Ile	Pro	Val	Thr	Thr
	290					295					300				
Thr	Leu	Met	Gly	Leu	Gly	Asn	Phe	Pro	Ser	Asp	Asp	Pro	Leu	Ser	Leu
305					310					315					320
Arg	Met	Leu	Gly	Met	His	Gly	Thr	Val	Tyr	Ala	Asn	Tyr	Ala	Val	Asp
				325					330					335	
Lys	Ala	Asp	Leu	Leu	Leu	Ala	Phe	Gly	Val	Arg	Phe	Asp	Asp	Arg	Val



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Thr	Gly	Lys	Ile	Glu	Ala	Phe	Ala	Ser	Arg	Ala	Lys	Ile	Val	His	Ile	
355					360					365						
Asp	Ile	Asp	Pro	Ala	Glu	Ile	Gly	Lys	Asn	Lys	Gln	Pro	His	Val	Ser	
370					375					380						
Ile	Cys	Ala	Asp	Val	Lys	Leu	Ala	Leu	Gln	Gly	Leu	Asn	Ala	Leu	Leu	
385					390					395					400	
Gln	Gln	Ser	Thr	Thr	Lys	Thr	Ser	Ser	Asp	Phe	Ser	Ala	Trp	His	Asn	
405					410					415						
Glu	Leu	Asp	Gln	Gln	Lys	Arg	Glu	Phe	Pro	Leu	Gly	Tyr	Lys	Thr	Phe	
420					425					430						
Gly	Glu	Glu	Ile	Pro	Pro	Gln	Tyr	Ala	Ile	Gln	Val	Leu	Asp	Glu	Leu	
435					440					445						
Thr	Lys	Gly	Glu	Ala	Ile	Ile	Ala	Thr	Gly	Val	Gly	Gln	His	Gln	Met	
450					455					460						
Trp	Ala	Ala	Gln	Tyr	Tyr	Thr	Tyr	Lys	Arg	Pro	Arg	Gln	Trp	Leu	Ser	
465					470					475					480	
Ser	Ala	Gly	Leu	Gly	Ala	Met	Gly	Phe	Gly	Leu	Pro	Ala	Ala	Ala	Gly	
485					490					495						
Ala	Ser	Val	Ala	Asn	Pro	Gly	Val	Thr	Val	Val	Asp	Ile	Asp	Gly	Asp	
500					505					510						
Gly	Ser	Phe	Leu	Met	Asn	Ile	Gln	Glu	Leu	Ala	Leu	Ile	Arg	Ile	Glu	
515					520					525						
Asn	Leu	Pro	Val	Lys	Val	Met	Val	Leu	Asn	Asn	Gln	His	Leu	Gly	Met	
530					535					540						
Val	Val	Gln	Trp	Glu	Asp	Arg	Phe	Tyr	Lys	Ala	Asn	Arg	Ala	His	Thr	
545					550					555					560	
Tyr	Leu	Gly	Asn	Pro	Glu	Cys	Glu	Ser	Glu	Ile	Tyr	Pro	Asp	Phe	Val	
565					570					575						
Thr	Ile	Ala	Lys	Gly	Phe	Asn	Ile	Pro	Ala	Val	Arg	Val	Thr	Lys	Lys	
580					585					590						
Ser	Glu	Val	Arg	Ala	Ala	Ile	Lys	Lys	Met	Leu	Glu	Thr	Pro	Gly	Pro	
595					600					605						
Tyr	Leu	Leu	Asp	Ile	Ile	Val	Pro	His	Gln	Glu	His	Val	Leu	Pro	Met	
610					615					620						
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Arg Thr Val Tyr																

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 Thr Gly Arg Lys Asn His Gln Arg His His Val Leu Pro Ala Arg Gly  
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 Arg Val Gly Ala Ala Ala Val Arg Cys Ser Ala Val Ser Pro Val Thr  
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ccg ccg tcc ccg gcg ccg ccg gcc acg ccg ctc cgg ccg tgg ggg ccg 248  
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gcc gag ccc cgc aag ggc gcg gac atc ctc gtg gag gcg ctg gag cgg 296  
 Ala Glu Pro Arg Lys Gly Ala Asp Ile Leu Val Glu Ala Leu Glu Arg  
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 Cys Gly Val Ser Asp Val Phe Ala Tyr Pro Gly Gly Ala Ser Met Glu  
 85 90 95

atc cac cag gcg ctg acg cgc tcc ccg gtc atc acc aac cac ctc ttc 392  
 Ile His Gln Ala Leu Thr Arg Ser Pro Val Ile Thr Asn His Leu Phe  
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cgc cac gag cag ggc gag gcg ttc gcg gcg tcc ggg tac gcg cgc gcg 440  
 Arg His Glu Gln Gly Glu Ala Phe Ala Ala Ser Gly Tyr Ala Arg Ala  
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tcc ggc cgc gtc ggg gtc tgc gtc gcc acc tcc ggc ccc ggg gca acc 488  
 Ser Gly Arg Val Gly Val Cys Val Ala Thr Ser Gly Pro Gly Ala Thr  
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 Asn Leu Val Ser Ala Leu Ala Asp Ala Leu Leu Asp Ser Val Pro Met  
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Val Ala Ile Thr Gly Gln Val His Arg Arg Met Ile Gly Thr Asp Ala	
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Phe Gln Glu Thr Pro Ile Val Glu Val Thr Arg Ser Ile Thr Lys His	
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Asn Tyr Leu Val Leu Asp Val Glu Asp Ile Pro Arg Val Ile Gln Glu	
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Ile Pro Lys Asp Ile Gln Gln Gln Met Ala Val Pro Val Trp Asp Thr	
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Ser Met Asn Leu Pro Gly Tyr Ile Ala Arg Leu Pro Lys Pro Pro Ala	
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Thr Glu Leu Leu Glu Gln Val Leu Arg Leu Val Gly Glu Ser Arg Arg	
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Pro Ile Leu Tyr Val Gly Gly Gly Cys Ser Ala Ser Gly Asp Glu Leu	
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cgc tgg ttt gtt gag ctg act ggt atc cca gtt aca acc act ctg atg	968
Arg Trp Phe Val Glu Leu Thr Gly Ile Pro Val Thr Thr Thr Leu Met	
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Gly Met His Gly Thr Val Tyr Ala Asn Tyr Ala Val Asp Lys Ala Asp	
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cca gca gag att gga aag aac aag caa cca cat gtg tca att tgc gca	1208
Pro Ala Glu Ile Gly Lys Asn Lys Gln Pro His Val Ser Ile Cys Ala	
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Ala	Asn	Pro	Gly	Val	Thr	Val	Val	Asp	Ile	Asp	Gly	Asp	Gly	Ser	Phe		
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ctc	atg	aac	att	cag	gag	ctg	gca	ttg	atc	cgc	att	gag	aac	ctc	cct	1640	
Leu	Met	Asn	Ile	Gln	Glu	Leu	Ala	Leu	Ile	Arg	Ile	Glu	Asn	Leu	Pro		
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Val	Lys	Val	Met	Val	Leu	Asn	Asn	Gln	His	Leu	Gly	Met	Val	Val	Gln		
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Asn	Pro	Glu	Cys	Glu	Ser	Glu	Ile	Tyr	Pro	Asp	Phe	Val	Thr	Ile	Ala		
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Tyr			
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225										235			240		
Trp	Asp	Thr	Ser	Met	Asn	Leu	Pro	Gly	Tyr	Ile	Ala	Arg	Leu	Pro	Lys
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Pro	Pro	Ala	Thr	Glu	Leu	Leu	Glu	Gln	Val	Leu	Arg	Leu	Val	Gly	Glu
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Ser	Arg	Arg	Pro	Ile	Leu	Tyr	Val	Gly	Gly	Gly	Cys	Ser	Ala	Ser	Gly
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Lys	Ala	Asp	Leu	Leu	Leu	Ala	Phe	Gly	Val	Arg	Phe	Asp	Asp	Arg	Val
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Tyr	Leu	Gly	Asn	Pro	Glu	Cys	Glu	Ser	Glu	Ile	Tyr	Pro	Asp	Phe	Val
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Ser	Glu	Val	Arg	Ala	Ala	Ile	Lys	Lys	Met	Leu	Glu	Thr	Pro	Gly	Pro
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 <211> 2301  
 <212> DNA  
 <213> *Oryza sativa*

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2301

<210> 39

<211> 644

<212> PRT

<213> Oryza sativa

<400> 39

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Pro	Val	Thr	Pro	Pro	Ser	Pro	Ala	Pro	Pro	Ala	Thr	Pro	Leu	Arg	Pro		
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Tyr Leu Gly Asn Pro Glu Cys Glu Ser Glu Ile Tyr Pro Asp Phe Val  
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Thr Ile Ala Lys Gly Phe Asn Ile Pro Ala Val Arg Val Thr Lys Lys  
580 585 590

Ser Glu Val Arg Ala Ala Ile Lys Lys Met Leu Glu Thr Pro Gly Pro  
595 600 605

Tyr Leu Leu Asp Ile Ile Val Pro His Gln Glu His Val Leu Pro Met  
610 615 620

Ile Pro Ser Gly Gly Ala Phe Lys Asp Met Ile Leu Asp Gly Asp Gly  
625 630 635 640

Arg Thr Val Tyr